



Flaxseed and Hypertension

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Flaxseed is rich in omega-3 fatty acids, lignans, fibre, and arginine and shows powerful blood pressure lowering effects.

The addition of 30 g/d of dietary flaxseed to standard of care improved the percentage of patients who were able to control their blood pressure from 34% to 53% following one year of intervention.¹

The therapeutic benefits of flaxseed may be greater than commonly prescribed antihypertensive medications.

Hypertension

Hypertension, known as the “silent killer”, represents a global health crisis contributing to 9.4 million deaths per year and affecting more than 40% of adults aged 25 years and older.² If left uncontrolled, hypertension can lead to heart attacks, strokes, kidney failure, blindness, dementia, and peripheral arterial disease (PAD), which is a serious plaque build-up in the arteries of arms and legs.²

When measuring blood pressure, the top number, or systolic pressure, refers to the pressure inside the arteries when the heart contracts and pumps blood through the body. The bottom number, or diastolic pressure, refers to the pressure inside the arteries when the heart is at rest and is filling with blood. Both are recorded in millimeters of mercury (mmHg) with normal being defined as less than 120/80mm Hg.³

Pre-Hypertension	120/80 – 139/89 mmHg
Stage 1 Hypertension	140/90 – 159/99 mmHg
Stage 2 Hypertension	160/100 mmHg or higher

Lifestyle factors that may lead to high blood pressure include heavy alcohol consumption, high salt intake, and obesity. Another potential cause is inflammation which can negatively affect the inside lining of blood vessels (the endothelium)⁴. Chronic inflammation can cause “endothelial dysfunction”, an imbalance between vasodilating and vasoconstricting substances produced by, or acting on, the endothelium. Enhanced constriction of the vessels can result in hypertension and further the development of atherosclerosis.⁴

Flaxseed lowers blood pressure

Flaxseed (*Linum usitatissimum*) is a rich source of protein, fat, and dietary fibre. Canadian flaxseed contains on average 41% fat, 20% protein, and 28% total dietary fibre. This modest seed has health-promoting qualities due to its content of four health-promoting components: the omega-3 polyunsaturated fatty acid alpha-linolenic acid (ALA), accounting for 20% of flaxseed dry weight, the plant lignan secoisolariciresinol digluconide (SDG), representing 1% of dry weight, soluble fibre representing 6% of dry weight, and protein.⁵

Saskatoon Oat & Seed Bread recipe at HealthyFlax.org



Flaxseed has a unique mix of fatty acids with low saturated fat content (only 7% of total fatty acids) as well as the essential polyunsaturated fatty acids (PUFA), omega-3 ALA and omega-6 linoleic acid (LA). Approximately 57% of the fatty acids are ALA, making flaxseed the richest plant source of this important omega-3.⁵

Research has been performed on the individual components of flaxseed to isolate their therapeutic effects. In adults with high blood cholesterol, adding one tablespoon (15 mL) of flaxseed oil (8 g of ALA) every day for 12 weeks lowered systolic/diastolic blood pressure by 10/8 mmHg.⁶ In obese adults, consumption of 20 g/d of flaxseed oil for 4 weeks improved mean arterial pressure by 13 mmHg.⁷ The intake of 543 mg/day of the flax lignan, SDG, for 24 weeks significantly lowered diastolic blood pressure by 4 mm Hg in older males and by 6.7 mmHg in those with metabolic syndrome, a group of risk factors that raises the risk for heart disease and other health problems.⁸



YELLOW FLAXSEED



YELLOW GROUND FLAXSEED



BROWN FLAXSEED



BROWN GROUND FLAXSEED



Although the individual flaxseed nutrients have demonstrated important health effects, the most powerful blood pressure lowering outcomes have been shown in humans with the consumption of whole ground flaxseed containing ALA, lignans, fibre and protein. In ground-breaking research, Canadian scientists discovered that 30 g/d of ground flaxseed reduced blood pressure in patients with PAD and uncontrolled hypertension by 15 mmHg (systolic) and 7 mmHg (diastolic) after 6 months (the FlaxPAD trial).⁹ This is larger than the average reduction achieved with standard doses of blood pressure lowering medications (such as diuretics, angiotensin converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers, and beta-blockers).¹⁰ A randomized, controlled, double-blinded clinical trial currently underway will investigate if ground flaxseed can lower blood pressure and prevent the need for medication in people newly diagnosed with Stage 1 Hypertension.¹¹

As a secondary observation to the FlaxPAD trial, the addition of 30 g/d of dietary flaxseed to standard of care (ongoing lifestyle and diet information plus medication) improved the percentage of patients who were able to control their blood pressure from 34% to 53% following one year of intervention.¹² In contrast, those patients under the same standard of care, but without dietary flaxseed, showed a worsening in blood pressure control from 44% to 35%.

In adults with metabolic syndrome, 30 g/d of whole ground flaxseed combined with lifestyle counseling lowered blood pressure by 8.8/5.0 mmHg in 12 weeks.¹³ The consumption of 40 g/d of whole ground flaxseed reduced blood pressure by 5.0/4.1 mmHg in healthy postmenopausal women after one year compared to baseline.¹⁴



Caribbean Crunch Muffin recipe at HealthyFlax.org

Mechanism of Action of Flaxseed

Flaxseed appears to reduce blood pressure through its ability to lower plasma oxylipins which are highly bioactive molecules produced in the body from PUFA. Some oxylipins can constrict and others can dilate blood vessels thereby affecting blood pressure. Flaxseed has been shown to reduce vasoconstrictive oxylipins by inhibiting soluble epoxide hydrolase, the enzyme that produces them.¹² Clinical trials are underway to investigate the safety and efficacy of drugs that inhibit soluble epoxide hydrolase in humans. While these drugs may take years to develop, flaxseed is currently readily available and offers a natural source of hypertension therapy.

Flaxseed ALA and lignans may contribute to blood pressure reduction through anti-inflammatory actions that improve the health of the endothelium.^{4,11} Flaxseed is also a source of the amino acid arginine comprising 11.3% of its protein.¹⁵ In 30 g of ground flaxseed there is approximately 680 mg of arginine. In the body, arginine is converted to nitric oxide which has the ability to lower blood pressure through blood vessel dilation.¹⁶

Scientific research supports the potent blood pressure lowering properties of flaxseed. The ALA, lignans, fibre, and protein content of flaxseed together may knockout this silent killer.

A Health Claim for Flaxseed

In 2014, Health Canada approved a health claim linking ground whole flaxseed to blood cholesterol lowering, a major risk factor for CVD.¹⁷ The claim – only one of eleven approved in Canada – was based on seven clinical research trials of normal and hypercholesterolemic males and females aged 8 to 75 years who consumed 30 to 50 g/day of ground flaxseed. The primary endpoints in these studies were total cholesterol and low density lipoprotein (LDL) cholesterol, recognized risk factors for CVD. The pooled results from these studies found that compared to baseline, total cholesterol levels decreased by 0.21 mmol/L (- 0.56 to - 9.01 percent) and LDL decreased by 0.22 mmol/L (- 3.42 to -14.94 percent).¹⁷ A reduction of 1 percent in total cholesterol levels is related to a 2 percent reduction in risk of CVD. Therefore, according to these studies, flaxseed intake may decrease the risk of CVD between 1 and 18 percent.



The “daily amount” referred to in the claim is 40 g (5 tablespoons) of ground whole flaxseed to be consumed over three eating occasions in the day.

An example of the permitted claim for ground flaxseed is: “16 g (2 tablespoons) of ground flaxseed supplies 40% of the daily amount shown to help lower cholesterol”. In addition to this primary statement, the following additional statements may be used:

- Ground (whole) flaxseed helps reduce/lower cholesterol
- High cholesterol is a risk factor for heart disease
- Ground (whole) flaxseed helps reduce/lower cholesterol, (which is) a risk factor for heart disease

Flaxseed has been consumed for centuries due to its desirable flavor and nutritional properties. In recent years, as people have become more concerned about health, demand for flaxseed in food and beverages has risen dramatically. Scientific research and now regulatory approval supports the heart health benefits of flaxseed, particularly due to ALA, fibre and lignan contents.

References

1. Caligiuri SP et al. *Curr Hypertens Rep.* 2014; 16(12):499.
2. World Health Organization. *A global brief on Hypertension: Silent killer, global public health crisis.* WHO/DCO/WHO/2013.2 ed. Geneva, Switzerland: World Health Organization; 2013.
3. The National Heart, Lung, and Blood Institute (NHLBI). *Guidelines for blood pressure.* 2012. <http://www.nhlbi.nih.gov/health/health-topics/topics/hbp> Accessed December 20, 2014
4. Puddu P, et al. *Acta Cardiol.* 2000; 55: 221-232..
5. Adolphe JL et al. *Br J Nutr.* 2010; 103: 929.
6. Paschos GK et al. *Eur J Clin Nutr.* 2007; 61: 1201.
7. Nestel PJ et al. *Arterio Thromb Vasc Bio.* 1997; 17: 1163.
8. Cornish SM et al. *Appl Physiol Nutr Metab.* 2009; 34: 89.
9. Rodriguez-Leyva D et al. *Hypertension.* 2013; 62(6):1081.
10. Law MR et al. *BMJ.* 2003; 326: 1427.
11. Caligiuri SP et al. *Trials.* 2014; 18(15):232.
12. Caligiuri SP et al. *Hypertension.* 2014; 64(1):53
13. Wu H et al. *J Nutr.* 2010; 140: 1937.
14. Dodin S et al. *J Clin Endocrinol Metab.* 2005; 90: 1390.
15. Udenigwe CC et al. *Food Chem.* 2012;132:468.
16. Marin E, Sessa WC. *Curr Opin Nephrol Hyper.* 2007; 16: 105.
17. Health Canada. 2014. *Summary of Health Canada’s Assessment of a Health Claim about Ground Whole Flaxseed and Blood Cholesterol Lowering* http://www.hc-sc.gc.ca/fn-an/alt_formats/pdf/label-etiquet/claims-reclam/assess-evalu/flaxseed-graines-de-lin-eng.pdf Accessed May 11 2014.

HealthyFlax.org is the source of information on the health benefits and uses of whole flaxseed, ground flaxseed and flaxseed oil. Our website includes recipes, nutritional evidence, facts and news about flaxseed in all its forms. HealthyFlax.org is supported by Canada’s flax growers, processors, food manufacturers and governments. For more information, email us at info@healthyflax.org



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